USDA Natural Resources Conservation Service

Ecological site R058AE018MT
Sands (Sa) RRU 58A-E 10-14" p.z.

Accessed: 05/16/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

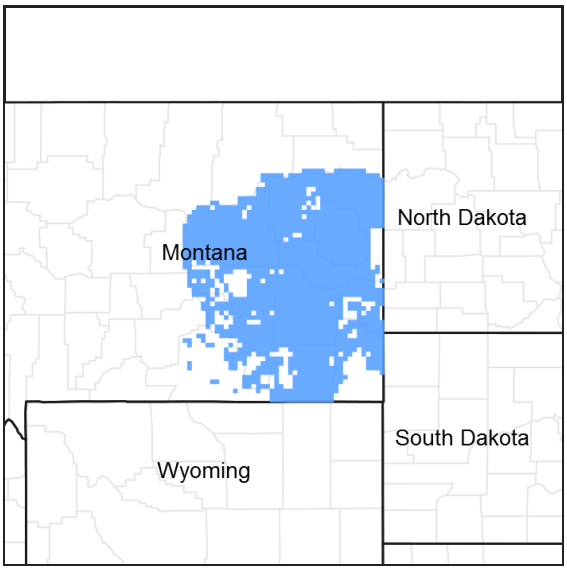


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Associated sites

R058AE003MT	**Sandy (Sy) RRU 58A-E 10-14" p.z.**
R058AE004MT	**Silty-Steep (SiStp) RRU 58A-E 10-14" p.z.**
R058AE006MT	**Sandy-Steep (SyStp) RRU 58A-E 10-14" p.z.**
R058AE019MT	**Shallow (Sw) RRU 58A-E 10-14" p.z.**

Similar sites

R058AE003MT	**Sandy (Sy) RRU 58A-E 10-14" p.z.** The Sandy site differs mainly in texture.
R058AE006MT	**Sandy-Steep (SyStp) RRU 58A-E 10-14" p.z.** The Sandy-Steep site occurs on slopes greater than 15%.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs on nearly level to strongly sloping sedimentary plains, terraces, and fans. It often has a dune like topography. The slopes are 0-15%, but mainly are less than 8%. This site occurs on all exposures. Aspect is not significant.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Dune (3) Plain
Flooding frequency	None
Ponding frequency	None
Elevation	579–1,067 m
Slope	0–15%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRAs 58A and 60B are considered to have a continental climate characterized by cold winters, hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are typical. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature. Seasonal precipitation is often limiting for plant growth. Annual fluctuations in species composition and total production are typical depending on the amount and timing of rainfall.
Temperatures can be very extreme in this part of Montana. Summer daytime temperatures are typically quite warm, generally averaging in the mid to upper 80º's F for July and August. Summertime temperatures will typically reach in the 100º's F at some point during the summer, and can reach 90º F any month between May and September. Conversely, winter temperatures can be cold, averaging in the mid teens to mid 20º's F for December and January. There will typically be several days of below zero temperatures each winter. It is not uncommon for temperatures to reach 30–40º F below zero, or even colder, most any winter.

Spring can be windy throughout these MLRA's, with winds averaging over 10 mph about 15 percent of the time. Speeds of 50 mph or stronger can occasionally occur as a weather system crosses this part of Montana.

MLRAs 58AE and 60BE have been divided into two distinct precipitation zones for the purpose of developing ecological site descriptions: 10–14" Mean Annual Precipitation (MAP) and 15–19" MAP.

10–14 inch zone:

The majority of the rangeland in these areas falls within the 11 to 13 inch range. During an average year, 70 to 75 percent of the annual precipitation falls between April and September, which are the primary growing season months.

Snowfall is not heavy in the area, averaging 28 total inches in the 10-14 inch MAP (Yellowstone Valley). Heavy snowfall occurs infrequently, usually late in the winter or early spring. Snow cover is typically 1 to 3 inches.

The frost free (32º F.) season averages about 105 to 145 days each year in the uplands, to nearly 170 days along the Yellowstone River Valley.

For local climate station information, refer to http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=mt.

Table 3. Representative climatic features

Frost-free period (average)	145 days
Freeze-free period (average)	170 days
Precipitation total (average)	356 mm

Influencing water features

Soil features

The soils are sands and loamy sands more than 20 inches deep. These soils are very susceptible to wind erosion.

Table 4. Representative soil features

Surface texture	(1) Sand (2) Loamy sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Rapid
Soil depth	51–152 cm
Available water capacity (0-101.6cm)	7.62–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4

Ecological dynamics

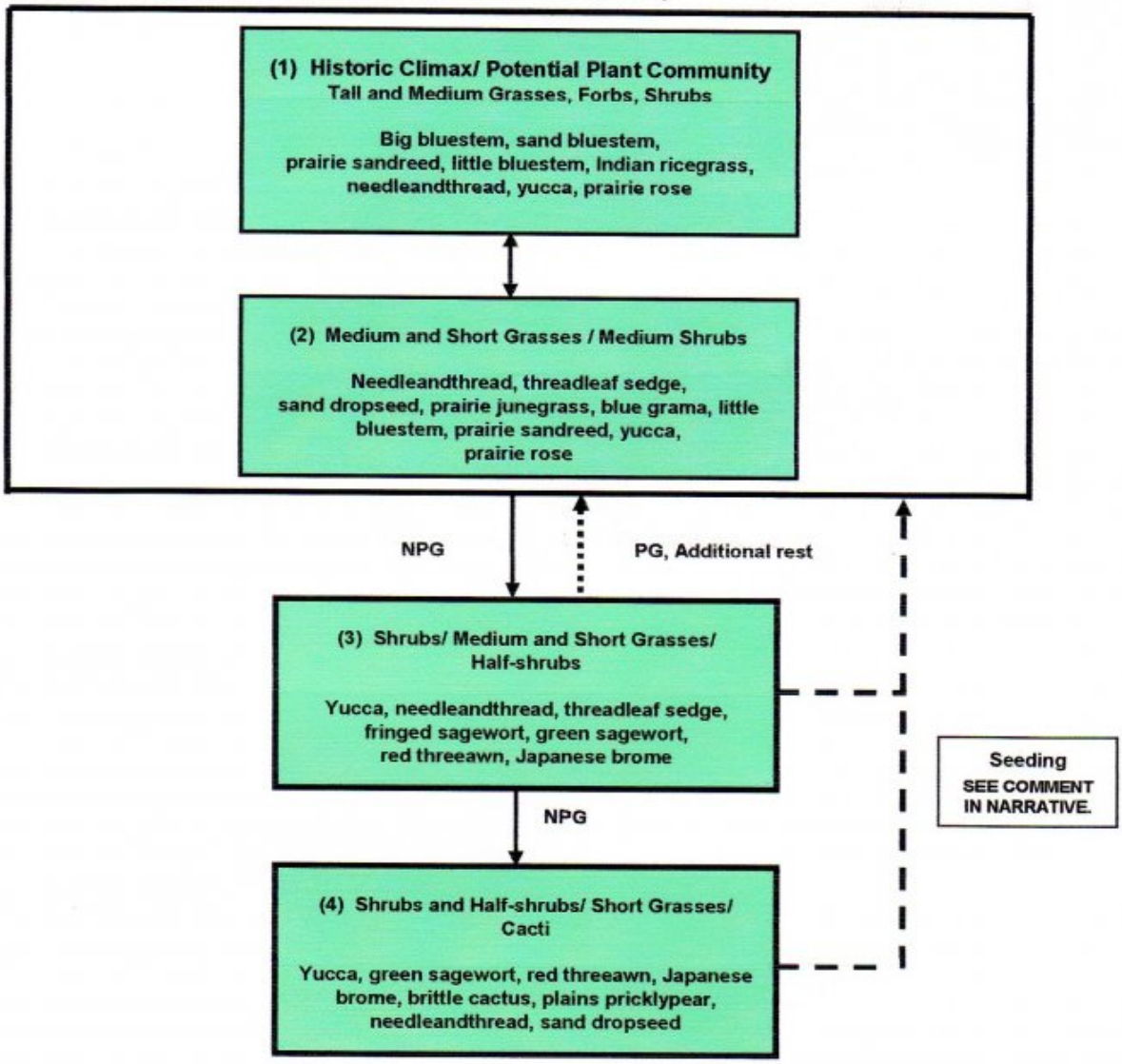
This site developed under Northern Great Plains climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). This community is given as a reference to understand the original potential of this site, and is not always considered to be the management goal for every acre of rangeland. The following descriptions should enable the landowner or manager to better understand which plant communities occupy their land, and assist with setting goals for vegetation management. It can also be useful to understand the environmental and economic values of each plant community.
This site is considered highly resilient to disturbance as it has only minor soil limitations for plant growth. Changes may occur to the Historic Climax Plant Community due to management actions and/or climatic conditions. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments, this site can more readily return to the Historic Climax Plant Community. Continual adverse impacts to this site over a period of years will result in the decrease of the taller grasses such as big bluestem, sand bluestem, and prairie sandreed to medium bunch and sod grasses including needleandthread, dryland sedges, and prairie junegrass. Medium shrubs, such as yucca, will increase with continued disturbance. Warm and cool season tall or medium grasses (prairie sandreed, Indian ricegrass, sand dropseed) and a medium shrub (yucca) will also occur in sand dunes.

Plants that are not a part of the climax community that are most likely to invade are annual grasses and brittle cactus.

State and transition model

MLRA: 58A – Sedimentary Plains, East
MLRA: 60B – Pierre Shale Plains, East
R058AE018MT, R060BE573MT

Plant Communities and Transitional Pathways (diagram)



Smaller boxes within a larger box indicate that these communities will normally shift among themselves with slight variations in precipitation and other disturbances. Moving outside the larger box indicates the community has crossed a threshold (heavier line) and will require intensive treatment to return to Community 1 or 2. Dotted lines indicate a reduced probability for success.

NOTE: Not all species present in the community are listed in this table. Species listed are representative of the plant functional groups that occur in the community.

PG = Prescribed Grazing: Use of a planned grazing strategy to balance animal forage demand with available forage resources. Timing, duration, and frequency of grazing are controlled and some type of grazing rotation is applied to allow for plant recovery following grazing.

NPG = Non-Prescribed Grazing: Grazing which has taken place that does not control the factors as listed above, or animal forage demand is higher than the available forage supply.

State 1
Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs

Community 1.1
Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. This plant community contains a good diversity of tall warm season grasses such as big bluestem, sand

bluestem, and prairie sandreed. There is a good diversity of medium and short grasses and sedges (little bluestem, Indian ricegrass, and needleandthread). A variety of forbs occur in small percentages. Shrubs that occur on this site include mainly yucca and prairie rose. This plant community is well adapted to the Northern Great Plains climatic conditions. The diversity in plant species and the presence of tall, deep-rooted perennial grasses allows for high drought tolerance. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable precipitation. Abundant plant litter is available for soil building and moisture retention. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This plant community provides for soil stability and a functioning hydrologic cycle. Good root systems and plant cover are critical for stability and erosion protection of this site due to the sandy soils. Removing the plant cover is the main reason areas of the Sands site are in dunes. Maintaining a healthy plant community provides for a properly functioning hydrologic cycle. Abundant plant litter is available for soil buildup and moisture retention.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	757	1513	2018
Forb	151	303	404
Shrub/Vine	101	202	269
Total	**1009**	**2018**	**2691**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	1-3%
Grass/grasslike foliar cover	50-60%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-2%
Grass/grasslike basal cover	15-20%
Forb basal cover	1-4%
Non-vascular plants	0%
Biological crusts	1-2%
Litter	40-49%
Surface fragments >0.25" and <=3"	0-4%
Surface fragments >3"	0%
Bedrock	0%
Water	0%

Bare ground	15-20%

Table 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	1-3%	50-60%	5-10%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2
Plant Community 2: Medium and Short Grasses/ Medium Shrubs

Community 2.1
Plant Community 2: Medium and Short Grasses/ Medium Shrubs

Slight degradation in the Historical Climax Plant Community usually results in a decrease of the larger bluestems and prairie sandreed and a slight increase in needleandthread, sand dropseed and the short grasses and sedges. Yucca, prairie rose, and fringed sagewort may increase in species composition. There are generally enough of the larger species remaining to allow the community to return to the HCPC fairly readily once management changes are implemented. Grass biomass production and litter become reduced on the site as the taller grasses disappear, increasing evaporation and reducing moisture retention. Additional open space in the community can result in undesirable invader species. This plant community provides for moderate soil stability.

State 3
Plant Community 3: Shrubs/ Medium and Short Grasses/ Half-shrubs

Community 3.1
Plant Community 3: Shrubs/ Medium and Short Grasses/ Half-shrubs

With continued heavy disturbance on Plant Communities 1 or 2, the plant community tends to become dominated by species such as yucca, needleandthread, threadleaf sedge, fringed and green sagewort, red threeawn, and annual grasses. There may still be small amounts of some species such as little bluestem and Indian ricegrass. Rest and/or seeding will be required to bring this site back across the ecological stability threshold. Because the soils associated with this site are very susceptible to blowing, special precautions will be needed when seeding. Using a cover crop, generally large seeded, warm season annuals (e.g., foxtail millet, sorghum-sudan grass) is usually necessary when trying to reseed these sandy soils.

State 4
Plant Community 4: Shrubs and Half-shrubs/ Short Grasses/ Cacti

Community 4.1
Plant Community 4: Shrubs and Half-shrubs/ Short Grasses/ Cacti

With continued heavy disturbance on Plant Community 3, the community often becomes dominated by yucca, green sagewort, red threeawn, Japanese brome, brittle cactus, plains pricklypear, and other annual grasses and forbs. This community is very unstable and sand dunes often develop. Plant Communities 3 and 4 are less productive than Plant Community 1 or 2. The lack of litter and short plant heights result in higher soil temperatures,

poor water infiltration rates, and high evaporation. This community has lost many of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy flow. These communities have extremely reduced production. Significant economic inputs and time would be required to move this plant community toward a higher successional stage and a more productive plant community.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Native grasses and sedges**			745–1749	
	big bluestem	ANGE	*Andropogon gerardii*	202–1076	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	101–942	–
	sand bluestem	ANHA	*Andropogon hallii*	101–673	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	50–269	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	50–269	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	50–269	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	50–269	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	10–135	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	0–135	–
2	**Native grasses and sedges**			10–269	
	Grass, perennial	2GP	*Grass, perennial*	10–135	–
	blue grama	BOGR2	*Bouteloua gracilis*	10–135	–
	threadleaf sedge	CAFI	*Carex filifolia*	10–135	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	10–135	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	10–135	–
	western wheatgrass	PASM	*Pascopyrum smithii*	10–135	–
	Sandberg bluegrass	POSE	*Poa secunda*	10–135	–
3	**Native grasses**			1–2	
	purple threeawn	ARPUP6	*Aristida purpurea var. purpurea*	1–2	–
Forb					
4	**Native forbs**			151–404	
	Forb, perennial	2FP	*Forb, perennial*	10–135	–
	tarragon	ARDR4	*Artemisia dracunculus*	10–135	–
	milkvetch	ASTRA	*Astragalus*	10–135	–
	white prairie clover	DACA7	*Dalea candida*	10–135	–
	purple prairie clover	DAPU5	*Dalea purpurea*	10–135	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	10–135	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	10–135	–
	buckwheat	ERIOG	*Eriogonum*	10–135	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	10–135	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	10–135	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	10–135	–

	dotted blazing star	LIPU	*Liatris punctata*	10–135	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	10–135	–
	spiny phlox	PHHO	*Phlox hoodii*	10–135	–
	white milkwort	POAL4	*Polygala alba*	10–135	–
	scurfpea	PSORA2	*Psoralidium*	10–135	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	10–135	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	10–135	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	10–135	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	10–135	–
5	**Native forbs**			1–2	
	white locoweed	OXSE	*Oxytropis sericea*	1–2	–
	deathcamas	ZIGAD	*Zigadenus*	1–2	–
Shrub/Vine					
6	**Native shrubs and half-shrubs**			101–269	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	10–45	–
	silver sagebrush	ARCA13	*Artemisia cana*	10–45	–
	prairie sagewort	ARFR4	*Artemisia frigida*	10–45	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–45	–
	skunkbush sumac	RHTR	*Rhus trilobata*	10–45	–
	prairie rose	ROAR3	*Rosa arkansana*	10–45	–
	snowberry	SYMPH	*Symphoricarpos*	10–45	–
	soapweed yucca	YUGL	*Yucca glauca*	10–45	–
7	**Native shrubs and half-shrubs**			1–2	
	brittle pricklypear	OPFR	*Opuntia fragilis*	1–2	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	1–2	–

Animal community

Livestock Grazing Interpretations:

Managed livestock grazing is suitable on this site as it has the potential to produce an abundance of high quality forage. The abundance of warm season species makes
this site especially valuable for use during mid-summer when the cool season species are past their optimum period of quality forage.

Management objectives should include maintenance or improvement of the plant community. Shorter grazing periods and adequate re-growth after grazing are recommended for plant maintenance and recovery. Heavy stocking and season long use of this site can be detrimental and will alter the plant community composition and production over time.

Whenever Plant Community 2 occurs (medium and short grasses), grazing management strategies need to be implemented to avoid further deterioration. This community is still stable, productive, and healthy provided it receives proper management. This community will respond fairly quickly to improved grazing management including increased growing season rest of key forage plants. Grazing management alone can usually move this community back to one more similar to potential.

Plant Communities 3 or 4 have extremely limited forage production (< 600 pounds per acre), and a high percentage of non-preferred species for cattle and sheep. Once this site is occupied by these communities, it will be more difficult to restore it to a community that resembles the potential with grazing management alone. Additional growing season rest is often necessary for re-establishment of the desired species and to restore the stability and

health of the site. Seeding may be necessary to restore desirable native perennial species.

Wildlife Interpretations:

The following is a description of habitat values for the different plant communities that may occupy the site:

Plant Community 1: Tall and Medium Grasses/Forbs/Shrubs (HCPC):
The predominance of grasses and sedges plus a diversity of forbs and half-shrubs in this community favors grazers and mixed feeders such as bison, pronghorn and elk. An abundance of warm season grasses extends the availability of nutritious forage throughout the summer. Suitable escape cover for mule deer is limited because of low shrub cover unless topographic features provide this habitat. The mix of tall and medium height grass residual cover along with abundant litter production creates favorable habitat for ground nesting birds including sharp-tailed grouse, upland sandpipers, vesper sparrows and grasshopper sparrows. Raptors are attracted to the diverse prey populations. A variety of forbs, grasses and half-shrubs attracts seed–eating small mammals like deer mice and pocket mice while heavy litter production favors herbivorous voles.

Plant Community 2: Medium and Short Grasses/ Medium Shrubs:
A reduction of warm-season grasses shortens the green feed period for grazers. Habitat value for ground-nesting birds and herbivorous small mammals is reduced as litter and residual grass production declines. Reduction of vegetative structural complexity decreases general habitat value for a variety of wildlife species.

Plant Community 3: Shrubs/ Medium and Short Grasses/ Half-shrubs:
Habitat value is poor for most wildlife species. Further reduction of litter and residual grass production limits ground-nesting bird habitat, although species favoring sparse cover, including long-billed curlews, McCown's longspur and horned larks may nest in this community. Annual grass and forb production may support populations of deer mice.

Plant Community 4: Shrubs and Half-shrubs/ Short Grasses/ Cacti:
Unstable dunes provide poor habitat values for the majority of wildlife species. After stabilization by tall and medium warm and cool season grasses, habitat values may be similar to Plant Community 1, above.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group A. The infiltration rates for these soils will normally be rapid to very rapid. The runoff potential for this site is very low. Runoff curve numbers generally range from 47 to 77.

Good hydrologic conditions exist on rangelands if plant cover (grass, litter, and brush canopy) is greater than 70%. Fair conditions exist when cover is between 30 and 70%, and poor conditions exist when cover is less than 30%. Sites in high similarity to HCPC (Plant Communities 1and 2) generally have enough plant cover and litter to optimize infiltration, minimize runoff and erosion, and have a good hydrologic condition. The deep root systems of the potential vegetation help maintain or increase infiltration rates and reduce runoff.

Sites in low similarity (Plant Communities 3 and 4) are generally considered to be in poor hydrologic condition as the majority of plant cover is from shallow-rooted annuals and shrubs. Erosion is minor for sites in high similarity. Rills and gullies should not be present. Water flow patterns, if present, will be barely observable. Plant pedestals are essentially non-existent. Plant litter remains in place and is not moved by erosion. Soil surfaces should not be compacted or crusted. Plant cover and litter helps retain soil moisture for use by the plants. Maintaining a healthy stand of perennial vegetation will optimize the amount of precipitation that is received. (Reference: Engineering Field Manual, Chapter 2 and Montana Supplement 4).

Recreational uses

This site provides recreational opportunities for big game and upland bird hunting, and hiking. The forbs have flowers that appeal to photographers. This site provides valuable open space and visual aesthetics. Travel across this site can be difficult because of the loose sand.

Other information

The following is an example of how to calculate the recommended stocking rate. This example does not use production estimates from this specific ecological site. You will need to adjust the annual production values and run the calculations using total annual production values from the ecological sites encountered on each individual ranch/pasture. Before making specific recommendations, an on-site evaluation must be made.

Example of total annual production amounts by type of year:
Favorable years = 2200 lbs/acre
Normal years = 1480 lbs/acre
Unfavorable years = 1200 lbs/acre

It is recommended that on slopes of 30% or less, stocking rate should be derived from the total annual production pounds minus 500 pounds for residual dry matter and 25% harvest efficiency. On slopes over 30%, stocking rate is derived from total annual production pounds minus 800 pounds for residual dry matter and 25% harvest efficiency. Refer to the NRCS National Range and Pasture Handbook for a list of Animal Unit Equivalents.

Sample Calculations using Favorable Year production amounts:

< 30% slopes: AUM/AC = [(2200-500)(0.25)]/915 lbs/month for one AU = 0.46 AUM/AC
AC/AUM = (1.0 AU)/(0.46AUM/AC) = 2.2 AC/AUM

> 30% slopes: AUM/AC = [(2200-800)(0.25)]/915 lbs/month for one AU = 0.38 AUM/AC
AC/AUM = (1.0 AU)/(0.38 AUM/AC) = 2.6 AC/AUM

NOTE: 915 lbs/month for one Animal Unit is used as the baseline for maintenance requirements. This equates to 30 lbs/day of air-dry forage (1200 lb cow at 2.5% of body weight).

Inventory data references

NRCS-Production & Composition Record for Native Grazing Lands (Range-417): 6

BLM-Soil & Vegetation Inventory Method (SVIM) Data: 10

NRCS-Range Condition Record (ECS-2): 8

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 11

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	06/11/2014
Approved by	Jon Siddoway
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

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2. **Presence of water flow patterns:** None on slopes less than 9 %. On slopes over 9% water flow patterns up to 4 inches wide and 2 feet long.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals up to one inch high are common. Pedestals up to 0.5 inch high are common. On slopes greater than 9% Terracettes may be present but should be less than 0.75 inches high.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is < 20%. Bare ground will occur as small areas less than 3 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present. Existing gullies should be “healed” with a good vegetative cover.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Active blowouts should not be present. Historic blowouts should be “healed” with a good vegetative cover.

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7. **Amount of litter movement (describe size and distance expected to travel):** Small herbaceous litter may be moved short distances (4inches) on slopes greater than 9%.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Surface Soil Aggregate Stability under plant canopy should typically be 5 or greater. Surface Soil Aggregate Stability not under plant canopy should typically be 5 or slightly less.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil survey series description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High grass canopy and basal cover and small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. A combination of shallow and deep rooted species has a positive effect on infiltration.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be**

mistaken for compaction on this site): No compaction layer or soil surface crusting should be evident

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Warm season, tall-stature, rhizomatous grasses

    Sub-dominant: Warm season, mid-stature, bunch grasses > forbs> Cool season, mid-stature, rhizomatous grasses = Cool season, short-stature, bunch grasses = Cool season, short-stature, rhizomatous grasses and sedges = shrubs and half shrubs

    Other: Minor components: Warm season, short-stature, rhizomatous grasses

    Additional: (Blue grama should be grouped with warm season, short-stature, rhizomatous grasses due to its growth form)

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very low.

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14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2100 to 2400 #/acre (13 to 14 inch precip. Zone) 900 to 1800 #/ac (10 to 12 inch precip. Zone).

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Sulphur cinquefoil, common tansy, oxeye daisy, Leafy spurge, knapweeds, whitetop, Dalmatian toadflax, yellow toadflax, St. Johnswort, perennial pepperweed. Kentucky bluegrass and smooth brome can be invasive on the eastern boarder of Montana for these MLRAs.

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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
